
Contact Details

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Career

- 02/2021 - Reader, University of Bath, UK
- 05/2020 - Leverhulme Early Career Fellow, University of Bath, UK
- 09/2018 - 01/2021 Prize Fellow, University of Bath, UK
- 01/2016 - 09/2018 Postdoctoral Research Associate, University of Cambridge, UK
- 05/2015 - 12/2015 Postdoctoral Research Associate, University College London, UK

Education

- 04/2012 - 04/2015 PhD in Medical Imaging, University College London, UK
- 10/2006 - 12/2011 MSc in Industrial Mathematics, University of Bremen, Germany

Honors and Awards

- 2022 Paper awarded the John Ockendon Prize 2022 by the European Journal of Mathematics
Paper selected as No 1 Pick for March by the Editor of Magnetic Resonance in Medicine
- 2020 Institute of Physics Outstanding Reviewer Award 2019
- 2019 Leverhulme Early Career Fellowship
Recognising Excellence Award 2019, University of Bath
- 2018 Prize Fellowship, Bath, UK
- 2017 Participant of the 5th Heidelberg Laureate Forum, Heidelberg, Germany
- 2016 Senior Member (College Post-Doctoral Associate), Jesus College, Cambridge, UK
- 2015 Pump-priming award: Six months funding to explore a new field of research, funded by the CMIC-EPSRC platform grant (EP/M020533/1)
Paper selected as a Highlight of 2015, IOP Inverse Problems
- 2014 Best Student Paper Finalist, IEEE NSS-MIC, Seattle, USA
LMS Best Poster Award, Cambridge, UK

Awards as supervisor

- 2022 My Postdoc Claire Deplancke has received the CoSeC Impact Award 2022 for her collaboration with CCP SyneRBI and CCPi.
- 2021 My PhD student collaborator Derek Driggs was awarded a 2nd Prize at the 20th IMA Leslie Fox Prize in Numerical Analysis event for our joint paper on "Accelerating Variance-Reduced Stochastic Gradient Methods".
My PhD student Ferdia Sherry was awarded a EPSRC Faculty of Mathematics Research Associate Award. This award will fund 9 months of his research post PhD.
- 2020 My PhD student Margaret Duff was awarded a Doctoral Recognition Award. Only 14 such awards were handed out to PhD students in Bath this year.
My undergraduate student Samuel Cortinhas was invited to Posters in Parliament as part of BCUR 2020.
My PhD student Margaret Duff was invited to the UK Parliament as part of STEM for BRITAIN 2020.
- 2019 My student Samuel Cortinhas won an IMI Best Poster Award, Bath, UK, value £100
- 2018 My PhD student Ferdia Sherry won the Best Poster Award at the Cantab Capital Institute for the Mathematics of Information – Connecting with Industry, Cambridge, UK

Third-party grants

My grants total £5.9M, of which about £1.3M support directly me and my group.

Major awards

- 01/2022 - 01/2027 CoI and Deputy Director, Mathematics of Deep Learning, EPSRC, £3,358k (my share £637k)
- 03/2021 - 03/2022 PI, Developing mathematical models to automatically identify artefacts in CT images of patients with Chronic Thromboembolic Pulmonary Hypertension, NIHR, £29k (my share £24k)
- 05/2020 - 04/2023 PI, Leverhulme Early Career Fellowship, £93k
- 04/2020 - 03/2025 CoI and Bath-PI, Synergistic Reconstruction for Biomedical Imaging, EPSRC, £476k (my share £23k)
- 09/2019 - 08/2023 Co-Lead and Bath-PI, PET++: Improving Localisation, Diagnosis and Quantification in Clinical and Medical PET Imaging with Randomised Optimisation, EPSRC, £821k (my share £346k)
- 07/2019 - 09/2021 CoI and Bath-PI, EPSRC Battery Characterisation, Quantitative Imaging of Multi-Scale Dynamic Phenomena at Electrochemical Interfaces, £1,131k (my share £186k)

Minor awards

Awards for workshops: 2x 2020, value \approx £7k, funders: Bath Institute for Mathematical Innovation, Isaac Newton Institute, London Mathematical Society

Awards for undergraduate summer projects: 2016, 2019, combined value \approx £3k, funders: Bath Institute for Mathematical Innovation, London Mathematical Society

Pump-priming award: six months of funding received from the CMIC-EPSRC platform grant (EP/M020533/1) to explore a new field of research, value \approx £20k, 2015

Travel awards: 2014, 4x 2019, combined value \approx £4k, funders: Bath Institute for Mathematical Innovation, Institute for Mathematics and its Applications, Institute Henri Poincaré, Inverse Problems Network UK, Society for Industrial and Applied Mathematics

NVIDIA Hardware Support: 2013, 2016, 2017, combined value \approx £6k

Review, Editorial & Scientific advisory activities

Associate editor: AIMS Applied Mathematics for Modern Challenges (Since 2022)

Guest editor: Special issue on "Joint Reconstruction and Multi-Modality/Multi-Spectral Imaging" for IOP Inverse Problems (2017-18); with S. Arridge and M. Burger.

Guest editor: Special issue on "Big Data Inverse Problems" for IOP Inverse Problems (2021-); with M. Chung and C. Schönlieb.

Guest editor: Special issue on "The Applied Mathematics of Machine Learning" for IMA Journal of Applied Mathematics (2022-); with D. Lesnic.

Referee for journals: AIMS Journal of Computational Dynamics, IEEE Access, IEEE Geoscience and Remote Sensing Letters, IEEE Transactions on Information Theory, IEEE Transactions on Medical Imaging, IEEE Transactions on Radiation and Plasma Medical Sciences, IEEE Transactions on Signal Processing, IOP Inverse Problems, IOP Physics in Medicine and Biology, SIAM Journal on Imaging Science, SIAM Journal on Optimization, Springer Applied Mathematics & Optimization, Springer Journal of Mathematical Imaging and Vision, Springer Machine Learning, Springer Numerical Algorithms, Springer Optimization Letters, Springer Sensing and Imaging, Wiley Magnetic Resonance in Medicine

Reviewer for books: CRC Press, Springer

Reviewer for conferences: MICCAI '18, ICML '19, NeurIPS '20, AISTATS '21, Fully3D '21, '23, SSVM '23

Reviewer for national and international funding bodies: British Council (UK), EPSRC (UK), Research Grant Council (Hong Kong)

Advisory: Member of the EPSRC Mathematical Sciences Early Career Forum

Organisation of Meetings

Conferences and Workshops (> 50 attendees)

2020 LMS-Bath Symposium on the Mathematics of Machine Learning, Bath, UK

Organiser of virtual 5-day conference with 28 national and international speakers and about 500 attendees from 6 different continents.

Member of scientific advisory boards: Synergistic Reconstruction Symposium '19, IMA Conference on Inverse Problems '19, '22

Minisymposia: Inverse Problems: Modelling and Simulation '14, SIAM Imaging Science '16, '18, '22, Applied Inverse Problems '17, '19, British Applied Mathematics Colloquium '17, 19, '22, 100 Years of the Radon Transform '17, SIAM Mathematics of Data Science '22, SIAM Optimization '23

Academic supervision

Postdoctoral fellows (4x)

- Hok Shing Wong (since 11/2022). Mathematical foundations of deep learning.
- Pawel Markiewicz (since 10/2022). PET image reconstruction and clinical translation.
- Claire Delplancke (01/2020-07/2022, then research engineer at CEA). Randomized optimization for PET imaging.
- Jarrod Williams (12/2019-07/2021, then PDRA at Bath Computer Science). Multi-modality and data-driven reconstruction for battery imaging.

PhD students (6x)

- Pablo Arratia Lopez (since 06/2022; lead supervisor with Lisa Kreusser). Physics Informed Neural Networks for Inverse Imaging.
- Mohammad Sadegh Salehi (since 06/2022; lead supervisor with Subhabip). Bilevel Learning for Inverse Problems.
- Seb Scott (since 06/2021; lead supervisor with Silvia Gazzola). Learning the Regularization for Inverse Problems.
- Margeret Duff (since 06/2019-12/2022; lead supervisor with Neill Campbell, Computer Science). Generative Machine Learning Models for Inverse Problems.
- Eric Baruch Gutiérrez Castillo (since 02/2019; sole supervisor). Randomized Algorithms for Large-Scale Convex Optimization.
- Ferdia Sherry (Cambridge, 10/2016-07/2021, then PDRA at Cambridge Maths; co-supervisor with Carola-Bibiane Schönlieb, Cambridge). Machine Learning for Inverse Problems.

PhD Examination (2x)

2022 David Alejandro Villacis Proano, Quito, Ecuador, Bilevel Imaging Learning with Total Variation Regularization: Optimality Conditions and Trust-Region Solution Algorithms

2022 Shaunagh Downing, Bath, UK, Optimising Seismic Imaging via Bilevel Learning: Theory and Algorithms

Teaching Experience

Lecturer (3x)

2022/23 Numerical Linear Algebra, University of Bath, UK

Level 3 and 5 (late undergraduate and postgraduate). For more information see <https://www.bath.ac.uk/catalogues/2022-2023/ma/MA30051.html>.

2018/19 Inverse Problems, University of Cambridge, UK

Part III of the Mathematical Tripos (postgraduate) with Lukas Lang. For more information see www.damtp.cam.ac.uk/research/cia/teaching/201718lentinvprob.html.

2016/17 Inverse Problems in Imaging, University of Cambridge, UK

Part III of the Mathematical Tripos (postgraduate) with Martin Benning. For more information see www.damtp.cam.ac.uk/research/cia/teaching/2016inverseproblems.html.

Student Supervision (18x)

Master projects (5x): Ben Bradshaw (2022/23), Luke Turton (2021/22), Varun Chhabra, Alice Smiddy (both 2018/19), Thomas Prideaux-Ghee (Cambridge, 2016/17)

Bachelor projects (1x): Sam Cortinhas (2019/20)

Summer students (4x): Sam Cortinhas (2018/19), Georg Maierhofer, Chris Irving, Emile Okada (all Cambridge, 2015/16)

Reading course (6x). Bath: 2x 2021/22, 3x 2020/21; Cambridge: 2017/18

Summer schools (2x): European Summer School in Modelling, Analysis and Simulation Crime and Image Processing (Oxford, 2016), Medical Image Computing Summer School (UCL, 2015)

Teaching Assistant (7x)

Bath: 2020/21; UCL: 2012/13, 4x 2013/14; Bremen: 2010/11

Research Stays

- 2019 Institutue Henri Poincaré, Paris, France (two weeks); École Polytechnique, Palaiseau, France (two weeks, hosted by Antonin Chambolle).
- 2018 King Abdullah University for Science and Technology, Saudi Arabia (one month, hosted by Peter Richtárik) DTU, Copenhagen, Denmark (three weeks, hosted by Yiqiu Dong).
- 2017 École Polytechnique, Palaiseau, France (one week, hosted by Antonin Chambolle).
- 2016 La Trobe University, Melbourne, Australia (two weeks, hosted by Reinault Quispel)
KTH Stockholm, Sweden (one week, hosted by Ozan Öktem)
University of Edinburgh, UK (one week, hosted by Peter Richtárik).

Public Outreach

- 2018 Coordinator of the CIA Pop-Up Lab, Mathematical Sciences Open Day at the Science Festival, Cambridge, UK
Interactive exhibitions Puzzle Race, Beyond what the eyes can see, Face Fusion Photobooth and Shadow Tomography with Thomas Buddenkotte, Derek Driggs, Joana Grah, Pan Liu, Carola-Bibiane Schönlieb and Rob Tovey.
- 2017 Mathematical Sciences Open Day at the Science Festival, Cambridge, UK
Two interactive exhibitions on Face Fusion Photobooth and Shadow Tomography with Martin Benning, Veronica Corona, Chris Irving, Emile Okada, Carola-Bibiane Schönlieb, Ferdia Sherry and Rob Tovey.

Memberships

Member of SIAM (activity groups: imaging, data science and optimization), Institute for Mathematics and its Applications

Publications, † denotes alphabetical order of authors

I have published 27 peer-reviewed journal papers, 1 book chapter, 7 preprints and 10 peer-reviewed conference papers.

Peer-Reviewed Journal Papers

51. † D. Chen, M. Davies, M. J. Ehrhardt, C.-B. Schönlieb, F. Sherry and J. Tachella. Imaging With Equivariant Deep Learning: From unrolled network design to fully unsupervised learning. *IEEE Signal Processing Magazine* 40.1 (2023), 134–147.
50. M. J. Ehrhardt, F. A. Gallagher, M. A. McLean and C. Schönlieb. Enhancing the spatial resolution of hyperpolarized carbon-13 MRI of human brain metabolism using structure guidance. *Magnetic Resonance in Medicine* 87.3 (2022), 1301–1312. (**selected as the No 1 Pick for March 2022**).
49. E. S. Riis, M. J. Ehrhardt, G. R. Quispel and C. B. Schönlieb. A Geometric Integration Approach to Nonsmooth, Nonconvex Optimisation. *Foundations of Computational Mathematics* 22.5 (2022), 1351–1394.
48. R. Brown, C. Kolbitsch, C. Delplancke, E. Papoutsellis, J. Mayer, E. Ovtchinnikov, E. Pasca, R. Neji, C. Da Costa-Luis, A. G. Gillman, M. J. Ehrhardt, J. R. McClelland, B. Eiben and K. Thielemans. Motion estimation and correction for simultaneous PET/MR using SIRF and CIL. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 379 (2021), 20200208.
47. E. Cueva, A. Meaney, S. Siltanen and M. J. Ehrhardt. Synergistic multi-spectral CT reconstruction with directional total variation. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 379 (2021), 20200198.
46. † S. R. Arridge, M. J. Ehrhardt and K. Thielemans. (An overview of) Synergistic reconstruction for multimodality/multichannel imaging methods. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 379 (2021), 20200205.
45. † E. Celledoni, M. J. Ehrhardt, C. Etmann, R. I. Mclachlan, B. Owren, C. B. Schonlieb and F. Sherry. Structure-preserving deep learning. *European Journal of Applied Mathematics* 32.5 (2021), 888–936. (**awarded the John Ockendon Prize 2022**).
44. † E. Celledoni, M. J. Ehrhardt, C. Etmann, B. Owren, C.-B. Schönlieb and F. Sherry. Equivariant neural networks for inverse problems. *Inverse Problems* 37.8 (2021), 085006.
43. † M. Benning, M. M. Betcke, M. J. Ehrhardt and C.-B. Schönlieb. Choose Your Path Wisely: Gradient Descent in a Bregman Distance Framework. *SIAM Journal on Imaging Sciences* 14.2 (2021), 814–843.
42. † M. J. Ehrhardt and L. Roberts. Inexact Derivative-Free Optimization for Bilevel Learning. *Journal of Mathematical Imaging and Vision* 63.5 (2021), 580–600.

41. †L. Bungert and M. J. Ehrhardt. Robust image reconstruction with misaligned structural information. *IEEE Access* 8 (2020), 222944–222955.
40. D. Driggs, M. J. Ehrhardt and C.-B. Schönlieb. Accelerating Variance-Reduced Stochastic Gradient Methods. *Mathematical Programming* (2020).
39. F. Sherry, M. Benning, J. C. D. los Reyes, M. J. Graves, G. Maierhofer, G. Williams, C.-B. Schönlieb and M. J. Ehrhardt. Learning the Sampling Pattern for MRI. *IEEE Transactions on Medical Imaging* 39.12 (2020), 4310–4321.
38. E. Ovtchinnikov, R. Brown, C. Kolbitsch, E. Pasca, C. da Costa-Luis, A. G. Gillman, B. A. Thomas, N. Efthimiou, J. Mayer, P. Wadhwa, M. J. Ehrhardt, S. Ellis, J. S. Jørgensen, J. Matthews, C. Prieto, A. J. Reader, C. Tsoumpas, M. Turner, D. Atkinson and K. Thielemans. SIRF: Synergistic Image Reconstruction Framework. *Computer Physics Communications* 249 (2020), 107087.
37. M. J. Ehrhardt, P. Markiewicz and C.-B. Schönlieb. Faster PET Reconstruction with Non-Smooth Priors by Randomization and Preconditioning. *Physics in Medicine & Biology* 64.22 (2019), 225019.
36. †M. Benning, E. Celledoni, M. J. Ehrhardt, B. Owren and C.-B. Schönlieb. Deep learning as optimal control problems: models and numerical methods. *Journal of Computational Dynamics* 6.2 (2019), 171–198.
35. V. Kolehmainen, M. J. Ehrhardt and S. R. Arridge. Incorporating Structural Prior Information and Sparsity into EIT using Parallel Level Sets. *Inverse Problems and Imaging* 13.2 (2019), 285–307.
34. V. Corona, M. Benning, M. J. Ehrhardt, L. F. Gladden, R. Mair, A. Reci, A. J. Sederman, S. Reichelt and C.-B. Schönlieb. Enhancing joint reconstruction and segmentation with non-convex Bregman iteration. *Inverse Problems* 35.5 (2019), 055001.
33. †A. Chambolle, M. J. Ehrhardt, P. Richtárik and C.-B. Schönlieb. Stochastic Primal-Dual Hybrid Gradient Algorithm with Arbitrary Sampling and Imaging Applications. *SIAM Journal on Optimization* 28.4 (2018), 2783–2808.
32. †L. Bungert, D. A. Coomes, M. J. Ehrhardt, J. Rasch, R. Reisenhofer and C.-B. Schönlieb. Blind Image Fusion for Hyperspectral Imaging with the Directional Total Variation. *Inverse Problems* 34.4 (2018), 044003.
31. Y. J. Tsai, A. Bousse, M. J. Ehrhardt, C. W. Stearns, S. Ahn, B. F. Hutton, S. Arridge and K. Thielemans. Fast Quasi-Newton Algorithms for Penalized Reconstruction in Emission Tomography and Further Improvements via Preconditioning. *IEEE Transactions on Medical Imaging* 37.4 (2018), 1000–1010.
30. P. J. Markiewicz, M. J. Ehrhardt, K. Erlandsson, P. J. Noonan, A. Barnes, J. M. Schott, D. Atkinson, S. R. Arridge, B. F. Hutton and S. Ourselin. NiftyPET: a High-throughput Software Platform for High Quantitative Accuracy and Precision PET Imaging and Analysis. *Neuroinformatics* 16.1 (2018), 95–115.
29. M. J. Ehrhardt, P. Markiewicz, M. Liljeroth, A. Barnes, V. Kolehmainen, J. Duncan, L. Pizarro, D. Atkinson, B. F. Hutton, S. Ourselin, K. Thielemans and S. R. Arridge. PET Reconstruction with an Anatomical MRI Prior using Parallel Level Sets. *IEEE Transactions on Medical Imaging* 35.9 (2016), 2189–2199.
28. M. J. Ehrhardt and M. M. Betcke. Multi-Contrast MRI Reconstruction with Structure-Guided Total Variation. *SIAM Journal on Imaging Sciences* 9.3 (2016), 1084–1106.
27. M. J. Ehrhardt, K. Thielemans, L. Pizarro, D. Atkinson, S. Ourselin, B. F. Hutton and S. R. Arridge. Joint Reconstruction of PET-MRI by Exploiting Structural Similarity. *Inverse Problems* 31.1 (2015), 015001. **(selected as a Highlight of 2015, IOP Inverse Problems)**.
26. M. J. Ehrhardt and S. R. Arridge. Vector-Valued Image Processing by Parallel Level Sets. *IEEE Transactions on Image Processing* 23.1 (2014), 9–18.
25. M. J. Ehrhardt, H. Villinger and S. Schiffler. Evaluation of Decomposition Tools for Sea Floor Pressure Data: A Practical Comparison of Modern and Classical Approaches. *Computers & Geosciences* 45 (2012), 4–12.

Preprints

24. †M. J. Ehrhardt and L. Roberts. ‘Analyzing Inexact Hypergradients for Bilevel Learning’. 2023.
23. †A. Chambolle, C. Delplancke, M. J. Ehrhardt, C.-B. Schönlieb and J. Tang. ‘Stochastic Primal Dual Hybrid Gradient Algorithm with Adaptive Step-Sizes’. 2023.
22. A. M. Rambojun, H. Komber, J. Rosedale, J. Suntharalingam, J. C. L. Rodrigues, M. J. Ehrhardt and A. Repetti. ‘Uncertainty Quantification in CT pulmonary angiography’. 2023.
21. D. Riccio, M. J. Ehrhardt and M. Benning. ‘Regularization of Inverse Problems: Deep Equilibrium Models versus Bilevel Learning’. 2022.

20. M. Duff, I. J. A. Simpson, M. J. Ehrhardt and N. D. F. Campbell. ‘Compressed Sensing MRI Reconstruction Regularized by VAEs with Structured Image Covariance’. 2022.
19. M. Duff, N. D. F. Campbell and M. J. Ehrhardt. ‘Regularising Inverse Problems with Generative Machine Learning Models’. 2021.
18. †M. J. Ehrhardt, E. S. Riis, T. Ringholm and C.-B. Schönlieb. ‘A Geometric Integration Approach to Smooth Optimisation: Foundations of the Discrete Gradient Method’. arxiv:1805.06444. 2018.

Peer-Reviewed Conference Papers

17. C. Delplancke, K. Thielemans and M. J. Ehrhardt. Accelerated Convergent Motion Compensated Image Reconstruction. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2021.
16. R. Brown, C. Kolbitsch, E. Ovtchinnikov, J. Mayer, A. G. Gillman, E. Pasca, C. Delplancke, E. Papoutsellis, G. Fardell, R. Neji, J. McClelland, B. Eiben, M. J. Ehrhardt and K. Thielemans. Status update on the Synergistic Image Reconstruction Framework : *16th International Meeting on Fully 3D Image Reconstruction in Radiology and Nuclear Medicine*. July. 2021, pp.440–443.
15. E. B. Gutiérrez, C. Delplancke and M. J. Ehrhardt. Convergence Properties of a Randomized Primal-Dual Algorithm with Applications to Parallel MRI. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*. Vol. 12679 LNCS. 2021, pp.254–266.
14. M. J. Ehrhardt and L. Roberts. Efficient hyperparameter tuning with dynamic accuracy derivative-free optimization. *OPT2020: 12th Annual Workshop on Optimization for Machine Learning*. 2020.
13. C. Delplancke, M. Gurnell, J. Latz, P. J. Markiewicz, C. Schönlieb and M. J. Ehrhardt. Improving a Stochastic Algorithm for Regularized PET Image Reconstruction. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2020.
12. D. Kazantsev, E. Pasca, M. Basham, M. Turner, M. J. Ehrhardt, K. Thielemans, B. A. Thomas, E. Ovtchinnikov, P. J. Withers and A. W. Ashton. Versatile regularisation toolkit for iterative image reconstruction with proximal splitting algorithms. *Proceedings of the 15th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*. 2019.
11. P. Markiewicz, M. J. Ehrhardt, N. Burgos, D. Atkinson, S. R. Arridge, B. F. Hutton and S. Ourselin. Unified Acquisition Modelling across PET Imaging Systems: Unified Scatter Modelling. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2016.
10. Y.-J. Tsai, A. Bousse, M. J. Ehrhardt, B. F. Hutton, S. R. Arridge and K. Thielemans. Performance Evaluation of MAP Algorithms with Different Penalties, Object Geometries and Noise Levels. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2015.
9. M. J. Ehrhardt, K. Thielemans, L. Pizarro, P. Markiewicz, D. Atkinson, S. Ourselin, B. F. Hutton and S. R. Arridge. Joint Reconstruction of PET-MRI by Parallel Level Sets. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2014. (**best student paper finalist**).
8. P. Markiewicz, K. Thielemans, M. J. Ehrhardt, J. Jiao, N. Burgos, D. Atkinson, S. R. Arridge, B. F. Hutton and S. Ourselin. High Throughput CUDA Implementation of Accurate Geometric Modelling for Iterative Reconstruction of PET Data. *IEEE Nuclear Science Symposium and Medical Imaging Conference*. 2014.

Miscellaneous

7. M. J. Ehrhardt. ‘Multi-modality Imaging with Structure-promoting Regularizers’. *Handbook of Mathematical Models and Algorithms in Computer Vision and Imaging: Mathematical Imaging and Vision*. Springer International Publishing, 2023, pp.235–272.
6. S. Cortinhas, M. Golbabaee and M. J. Ehrhardt. ‘A temporal multiscale approach for tissue quantification using MR Fingerprinting acquisitions’. 2020.
5. †L. Bungert, M. J. Ehrhardt and R. Reisenhofer. Robust Blind Image Fusion for Misaligned Hyperspectral Imaging Data. *Proceedings in Applied Mathematics & Mechanics*. Vol. 18. 1. 2018.
4. M. J. Ehrhardt, P. J. Markiewicz, P. Richtárik, J. Schott, A. Chambolle and C.-B. Schönlieb. Faster PET Reconstruction with a Stochastic Primal-Dual Hybrid Gradient Method. *SPIE Optics+Photonics: Wavelets and Sparsity XVII, San Diego, USA*. 2017.
3. †M. Benning, M. Betcke, M. J. Ehrhardt and C.-B. Schönlieb. Gradient Descent in a Generalised Bregman Distance Setting. *Geometric Numerical Integration and its Applications, Melbourne, Australia*. 2016.
2. M. J. Ehrhardt. ‘Joint Reconstruction for Multi-Modality Imaging with Common Structure’. PhD Thesis. University College London, 2015.

1. M. J. Ehrhardt. ‘Sparsity in Geosciences Sparse Decomposition for Analysis of Sea Floor Pressure Data’. MSc Thesis. University of Bremen, 2011.

———— **Communication**, * denotes invited presentations

I have given 65 presentations out which 51 were invited. These include 21 (11 invited) presentations at conferences, 22 (18 invited) at workshops and 22 at seminars.

Oral Presentations at Conferences and Seminars

- 2023 * Inverse Biophysical Modeling and Machine Learning in Personalized Oncology, Dagstuhl, Germany.
* Deep learning for Industry workshop, Bath, UK.
- 2022 * Data-Enabled Science Seminar, Houston, USA.
* Computing Seminar, Buckingham, UK.
* Mathematics of Data Science Seminar, Graz, Austria.
* Advanced Image Reconstruction Methods, UCL, London, UK.
* HCM Workshop: Synergies between Data Science and PDE Analysis, Bonn, Germany.
* Analytic and Geometric Approaches to Machine Learning, Bath, UK.
* SIAM Imaging Science, Berlin (virtual), Germany.
* Inverse Problems Methods, Applications and Synergies, Pontificia Universidad Católica de Chile (virtual), Chile.
- 2021 * One World Seminar Series on the Mathematics of Machine Learning, virtual.
* Clinical Molecular Imaging Group, Cambridge (virtual), UK.
* Signal and Image Processing Laboratory Seminar, Heriot-Watt (virtual), UK.
* Differential Equations and Numerical Analysis Seminar, NTNU (virtual), Norway.
* Centre for Inverse Problems Seminar, UCL (virtual), UK.
* International SPINlab Users Webconference, San Francisco (virtual), USA.
* Mathematical Optimization Group Research Seminar, Tübingen, Germany.
* Mathematics of Deep Learning Seminar, FAU Erlangen-Nürnberg (virtual), Germany.
* Deep learning and inverse problems, INI, Cambridge, UK.
* Theory of Deep Learning, INI, Cambridge (virtual), UK.
* ICMS-LMS Analytic and Geometric Approaches to Machine Learning, virtual.
- 2020 * SIAM Mathematics of Data Science, virtual.
* Scottish Numerical Methods Network 2020: Inverse problems and optimisation for PDEs, virtual.
- 2019 * Applied Mathematics Seminar, Leicester, UK.
* Quantitative Imaging of Electrochemical Interfaces, Diamond Light Source, UK.
2nd IMA Conference On Inverse Problems From Theory To Application, London, UK.
* Applied Inverse Problems, Grenoble, France.
* Inverse Problems Seminar, UCL, UK.
* SAMBa’s 9th Integrative Think Tank, Bath, UK.
* Bath/RAL Numerical Analysis Day, Bath, UK.
- 2018 * Numerical Analysis Seminar, Bath, UK.
* ISMP 2018: International Symposium on Mathematical Programming, Bordeaux, France.
SIAM Conference on Imaging Science, Bologna, Italy.
* Applied and Interdisciplinary Mathematics Seminar, Bath, UK.
* Scientific Computing Seminar, DTU, Denmark.
* Optimization and Big Data, KAUST, Saudi Arabia.
- 2017 * Mathematics and Applications Seminar, Sussex, UK.
5th Heidelberg Laureate Forum, Heidelberg, Germany.
IMA Conference on Inverse Problems from Theory to Application, Cambridge, UK.
* SPIE Optics+Photonics: Wavelets and Sparsity XVII, San Diego, USA.
* 27th Biennial NA Conference in Strathclyde, Glasgow, UK.

- * Mini Workshop on Bayesian Inverse Problems and Imaging, Shanghai, China.
- * Applied Inverse Problems, Hangzhou, China.
- British Applied Mathematics Colloquium, Guildford, UK.
- * 100 Years of the Radon Transform, Linz, Austria.
- * Mathematical Imaging with Partially Unknown Models, Cambridge, UK.
- 2016 * UCL PET/MR Symposium, London, UK.
- * Numerical Analysis Seminar, KTH Stockholm, Sweden.
- * SIAM Conference on Imaging Science, Albuquerque, USA.
- * Edinburgh Research Group in Optimization, University of Edinburgh, UK.
- * Big Data, Multimodality & Dynamic Models in Biomedical Imaging, INI, Cambridge, UK.
- 2015 Applied Inverse Problems Conference, Helsinki, Finland.
- * The 4th Joint BMC and BAMC, Cambridge, UK.
- * Data Processing Challenges in PET-MR, London, UK.
- 2014 * STIR User Meeting at IEEE NSS-MIC, Seattle, USA.
- IEEE Medical Imaging Conference (NSS-MIC), Seattle, USA (**best student paper finalist**).
- * Institute for Nuclear Medicine Seminar, UCL, UK.
- * Oberseminar Angewandte Mathematik, Münster, Germany.
- Imaging with Modulated/Incomplete Data, Graz, Austria.
- * Centre for Medical Image Computing Seminar, UCL, UK.
- SIAM Conference on Imaging Science, Hong Kong, China.
- Inverse Problems: Modelling and Simulation, Fethiye, Turkey.
- 2013 Inverse Days, Inari, Finland.
- * Image Reconstruction in Emission Tomography and Hybrid Imaging, London, UK.

Poster Presentations

- 2023 Interfacing Bayesian statistics, machine learning, applied analysis, and blind and semi-blind imaging inverse problems, Edinburgh, UK.
- 2019 Royal United Hospital, Bath, UK.
- 2017 Developments in Healthcare Imaging - Connecting with Industry, Cambridge, UK.
- Generative Models, Parameter Learning and Sparsity, Cambridge, UK.
- Variational Methods, New Optimisation Techniques and New Fast Numerical Algorithms, Cambridge, UK.
- 2016 CCIMI Launch Event, Cambridge, UK.
- University of Cambridge Mathematics and Big Data Showcase, Cambridge, UK.
- High-dimensional Statistics, Inverse Problems and Convex Analysis, London, UK.
- EPSRC CMiH Launch Event, Cambridge, UK.
- LMS Inverse Day: Big Inverse Problems, Nottingham, UK.
- 2014 LMS Inverse Day: Sparse Regularisation for Inverse Problems, Cambridge, UK (**best poster award**).
- 2013 Applied Inverse Problem Conference, KAIST, Daejeon, South Korea.